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Determinants of bank profitability: Evidence from Morocco

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Abstract

This paper aims to identify the determinants of Moroccan banks' profitability, measured by Net Interest Margin (NIM) during the period (2005-2018).

Applying the ordinary least square (OLS) method and panel data analysis for the eight (8) main Moroccan banks, five (5) econometric linear models were used, including bank-specific variables (size, capitalization, operational efficiency, credit-risk, liquidity, deposits), industry level and macroeconomic variables (concentration and economic growth).

The empirical results showed that NIM is exclusively influenced by internal factors. External factors don't have any significant impact on profitability during the considered period. Bank size was found to have a significant negative effect on NIM. The other factors that have negative impacts are diversification and level of deposits. Whereas credit risk, capitalization and operational efficiency tend to increase profitability of banks in Morocco in terms of NIM. Consequently, Moroccan Bank managers who want to increase the profitability of their banks should ensure to increase the level of bank capital, reduce the level of the general operating expenses, take more credit risk and not bet on income diversification nor on the growth of assets' size which are not favorable to improving the Net Interest Margin.

This is the first study of the determinants of Moroccan banks NIM during a large period including the major part of the period of BASEL III framework implementation. This research is of great interest insofar as the results obtained allow bank managers to better understand the factors that act on the profits and offer them better levers for action, control and forecasting. It also provides banks regulators with insights to eventually review the prudential system applicable to banks. The external factors examined in this study are limited to the growth of GDP and concentration. The effect of other external factors such as taxation, exchange rate, interest rate, inflation… could be examined by future studies on Moroccan banking system profitability.

Keywords: Bank Profitability, Nim, Internal Factors, External Factors, Panel Data Analysis.
JEL Classification : E32, E43, G21
Paper type: Empirical research

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1. Introduction

Banks play an important economic function. They provide financial intermediation by converting deposits into productive investments. In this respect, banks are important providers of funds, and their stability is critical for the financial system. It is generally agreed that sound banking is a requirement for sustainable economic development. As bank profitability is one of the mains factors of the stability of the banking system (Ali & Puah (2019)), a large number of theoritical and empirical studies have tried to identify the determinants of bank profitability.

The first studies on bank profitability's determinants were carried out by Haslem (1968), Short (1979) and Bourke (1989). Numerous other studies were conducted in different countries and regions, employing various methods and producing sometimes contradictory results.

In Morocco, a few studies have focused on the determinants of banks' profitability. One of them was conducted by Mansouri & Afroukh (2009) who studied the profitability of banks in Morocco over the period 1993-2006. There is also the study conducted by Bahyaoui (2017) who focused her study on the internal determinants of banking profitability in Morocco.

However, these studies either focused on periods prior to the entry into force of the Basel II and III frameworks or aimed to identify a single category of determinants of banking profitability.

On the basis of these observations, the objective of this study is to remedy the shortcomings of previous research by studying the internal and external determinants of bank profitability in Morocco in the current context marked by the implementation of Basel regulations. The central research question is: "what are the internal and external factors that explain the profitability of banks in Morocco in the context of implementation of Basel regulations ?".

For this purpose, Following the example of previous studies on the determinants of bank profitability (Molyneux and Thornton (1992), Demirguc-Kunt and Huizinga (2000) and Goddard et al. (2004)), we will conduct an empirical study based on use of linear regression models applied to data of a sample of banks representative of the Moroccan banking sector; These econometric models aim to estimate the impact of certain factors on the profitability of banks using the ordinary least squares method and the panel data analysis technique.

The remainder of this paper is structured as follows : Section 2 reviews literature on bank profitability's determinants and presents the main research hypotheses, Section 3 describes the research methodology, sample and data used, Section 4 presents the empirical results and Section 5 concludes.

2. Literature review and hypothesis development

Bank porfitability and its determinants have received considerable attention in academic literature and have been widely investigated both theoretically and empirically. The first studies on bank profitability's determinants were carried out by Haslem (1968), Short (1979) and Bourke (1989). This section provides an overview of the major studies related to the determinants of bank profitability.

The three main profitability measures used in these studies are: return on equity (or ROE) calculated by the ratio of net income to equity, return on assets (or ROA) calculated by the ratio of net income to total assets and the net interest margin (NIM) calculated by the ratio of the interest margin to total assets. ROE measures the return on capital invested by shareholders. There are many studies that have taken ROE as measure of banking profitability: (Molyneux & Thornton (1992); Berger (1995); Goddard *et al.* (2004). ROA, on the other hand, measures the profit generated by all assets and is considered a measure of management efficiency. One of the drawbacks of this ratio is that it does not take into account the off-balance sheet, which is a significant source of income for banks. Among the studies that have taken the ROA as measure of profitability, we find those conducted by: Athanasoglou *et al.* (2004) ; Ani *et al.* (2012);

Perera *et al.* (2013); Anarfi *et al.* (2016) and Ozili (2017). The NIM measures the profit earned from a bank's core business, which is credit intermediation (collecting deposits and distributing loans). Among the studies that have used NIM as measure of profitability, we can cite Angbazo (1997) in the United States and Reda *et al.* (2016) in Lebanon.

The studies on the determinants of bank profitability can be broken down into two main categories : the first one focuses on studying the determinants of bank's profitability in one particular country while the second one examines a panel of countries.

2.1. Studies of bank profitability's determinants in a panel of countries

Studies on the determinants of banking profitability in a panel of countries can be classified into three sub-categories: first, we find global studies that cover a large number of countries from several continents. The second sub-category includes continental studies covering countries from a specific continent (Europe, Africa, etc.). The last sub-category includes studies covering specific regions (Sub-Saharan Africa, MENA, the European Union…etc.).

2.1.1. Global studies

In the sub-category of global studies, we find the study conducted by Short (1979) who analyzed the relationship between concentration and profitability of a sample of 60 banks operating in Canada, Japan and Western Europe. The empirical results have shown that the profitability measured by the ROE is slightly higher when the concentration is greater and that large banks are more profitable. Short (1979) explains this by the fact that large banks have the capacity to raise funds at lower costs and therefore to generate higher profits. Bourke (1989) studied the determinants of the profitability of 90 banks in Europe, North America and Australia over the period 1972-1981 and demonstrated that the higher the capitalization ratio of a bank, the higher its prfitability. He also highlighted the positive relationship between the level of liquidity and profitability. Likewise, inflation and concentration have positive effects on profits. On the other hand, the level of personnel costs and the credit risk have negative effects on profitability. Demirguc-Kunt & Huizinga (1999) examined the determinants of the net interest margin and the profitability of several banks in 80 countries over the period 1988 -1995 and highlighted the positive relationship between the level of equity and financial performance. They also proved that the increase in the « bank assets-to-GDP » ratio and the reduction in banking concentration lead to a reduction in net margin and bank profits. The results also highlighted that foreign banks have larger margins and profits compared to domestic banks in developing countries. While in developed countries, local banks have larger margins and higher profits.

Dietrich & Wanzenried (2014) used a sample of 10,165 commercial banks from 118 countries during the period 1998-2012 and found that the country's income level has an influence on the determinants of the profitability of its banking system. They proved that the level of capitalization has a significant positive effect on banks' profits only in high-income countries. Operational inefficiency has a negative effect on bank profitability in all countries studied regardless of their level of income. Credit risk has also a negative effect on banks'profitability in all countries. The degree of income diversification positively affects banks' profits in the case of moderate and high income countries. State ownership of bank capital has a negative effect on bank profitability only in the case of low and moderate income countries.

2.1.2. Continental studies

The determinants of banking profitability in Europe have been widely explored. (Molyneux & Thornton (1992) are among the first to explore the internal, sectoral and macroeconomic determinants of the profitability of a set of banks in 18 European countries over the period

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1986-1989. The results obtained proved the existence of a positive relationship between return on equity, the level of interest rates in each country, banking concentration and state ownership.

Brissimis et *al.* (2008) studied the link between banking sector reform and the performance of banks in 10 countries that joined the European Union and found a negative relationship between liquidity and net interest margin.

In Latin America, Saona (2016) has shown that banking profitability is positively correlated with the level of capital and diversification of assets as well as with the degree of concentration of the banking market. However, the profits decrease with the diversification of income. Saona (2016) also demonstrated that the relationship between profitability and the level of capital is not linear and that when the level of capital is excessive, profitability is negatively affected.

2.1.3 Studies on specific regions

The banking systems of many regions have been studied in order to identify the factors that affect their profitability. In the MENA region, Caporale *et al.* (2016) studied the main determinants of the profitability of domestic and foreign banks as well as the impact of the international financial crisis on the banking sector. They used data of 122 banks from 17 MENA countries over the period 2000-2012. The results obtained showed that during the international financial crisis, domestic banks outperformed foreign banks and that the size is not a determining factor of profitability. In addition, the ratio of net receivables to total assets has a negative impact on the profitability of assets whereas the growth rate of GDP has a positive impact. Other researchers have also studied the profitability of banks in the MENA region or in GCC countries: Alzoubi (2018); Bashir (2000); Olson & Zoubi (2011).

In Sub-Saharan Africa, (Munyambonera, 2013) studied a sample of 216 commercial banks from 42 countries in this region of Africa and demonstrated that the profitability of these banks is determined both by internal and macroeconomic factors. In addition, He found that profitability is positively impacted by the bank's level of capitalization and by the growth of deposits. On the other hand, it is negatively correlated with liquidity, operational inefficiency as well as economic growth and inflation.

2.2 Studies on bank profitability' determinants in single countries

Below, an overview of the studies carried out by country grouped by continent.

2.2.1 Studies in single countries in America

In the United States, LIU (2013) used a sample of 8,677 American banks over the period of the international financial crisis from 2007 to 2012 and demonstrated that the factors which have a positive and significant impact on the ROA are : the level of capital, the interest rate of the FED, the size of the bank, the proportion of shares in total assets and the market capitalization of banks listed on the NASDAQ. On the other hand, the following factors: the level of deposits and the banking concentration have negative and significant effects on the ROA. The study showed that the relationship between ROA and the level of capital is not linear. The study also demonstrated the existence of economies of scale in the US banking sector because size is positively correlated with profitability. Other studies in the United States were carried out by Berger (1995) and Angbazo (1997). In South America, Afanasieff *et al.* (2002) studied bank profitability in Brazil.

2.2.2 Studies on African countries

In Morocco, Bahyaoui (2017) applied the technique of panel data analysis on a sample of eight (8) banks over the period 2004-2015 and demonstrated that the determinants of the banks' profitability (measured by the Global Gross Margin) are capitalization ratio; credit risk; cost of funding; bank's market share; liquidity and operational efficiency. The effects on profitability

of capitalization ratio, credit risk and cost of funding are positive. Bahyaoui (2017) explained the positive impact of the credit risk and the cost of funding by the fact that Moroccan banks pass these two elements on to their customers to compensate for the loss. The empirical study also highlighted the fact that banks with private capital (whether domestic or foreign) outperform banks with state-owned capital and that non listed banks outperform those that are listed on the stock exchange.

Mansouri & Afroukh (2009) also studied the determinants of bank profitability in Morocco (measured by the ROA and net interest margin) over the period 1993-2006. Empirical results highlighted the negative relationship between general expenses and profitability of assets which confirms the negative impact of operational inefficiency on profits. The effect of capitalization on ROA is also negative. Moreover, the empirical study revealed a negative relationship between the size of the bank measured by the natural logarithm of total assets and the return on assets suggesting that in general, the theory of economies of scale does not apply in the case of Morocco. On the other hand, the development of the banking sector increases the level of competition between banks which ultimately leads to lower profits. The development of the capital market has a positive effect on increasing bank profits. Finally, with regard to macroeconomic variables, economic growth and inflation seem to positively affect the return on assets of banks in Morocco.

Other studies focused on African countries: Rachdi (2013) in Tunisia; Ozili (2015) in Nigeria; Anarfi et a*l.* (2016) in Ghana; Almumani (2013) in Jordan; Melaku & Melaku (2017) in Ethiopia.

2.2.3 Studies on Asian countries

Asian countries have also been the subject of research of their banking systems' profitability. In China, Garcia-Herrero *et al.* (2009) demonstrated that the best capitalized banks tend to have a higher return on assets. Likewise, banks that are more efficient and have more deposits and a lower market share tend to be more profitable in terms of ROA. Moreover, real interest rates and inflation have a positive impact on profitability, unlike the volatility of interest rates which has a negative impact. In India, Reddy (2011) found that efficiency, level of equity, share of loans in total assets, volume of personnel costs to total assets have a positive and statistically significant influence on ROA and NIM. Income diversification has a statistically positive effect on ROA. The increase in the size of bank assets to GDP reflects increased competition between banks, which translates into lower profits. Banking concentration also has a negative effect on both measures of profitability. On the other hand, the development of the stock market has a significantly positive impact on profits. As for macroeconomic variables, only inflation and the rate of GDP growth positively influence profits. Interest rates negatively affect profits. The empirical study has also shown that state-owned banks are less profitable than their private counterparts. The same is true of foreign banks, which turn out to be more profitable than domestic ones.

2.2.4 Studies on European countries

In Europe, Alexiou & Sofoklis (2009) studied the microeconomic and macroeconomic determinants of profitability (measured by the ROE) of six Greek banks over the period 2000-2007 using the panel data analysis approach (fixed effects) and showed a positive but slight relationship between inflation and bank profitability. Regarding internal determinants, the size of the bank has a positive and very significant effect on profitability, which confirms the theory of economies of scale. As for the level of capital, it has a statistically positive effect on profits. The credit risk negatively affects profits. Productivity also has a negative and significant effect on profits which is surprising as a result. This unexpected result was explained by the fact that Greek banks have not yet reached the optimal number of employees for assets under management. Regarding the cost-to-income ratio, its negative influence on profitability is

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highly significant, which implies that management efficiency is a prerequisite for improving the profits of the Greek banking system. Empirical analysis has also proven the inverse relationship between liquidity and profitability. Other studies have focused on European countries: Athanasoglou et *al.* (2006), Trujillo- Ponce (2013).

2.3. Development of hypotheses

The extensive research on the factors that influence bank profitability has made it possible to highlight a certain number of determinants of bank profitability, which can be classified into two main categories. On the one hand, there are factors specific to banks (idiosyncratic, microeconomic or internal bank factors) on which top management of banks can act and, on the other hand, external factors. These latter include macro-financial or sectoral factors (which relate to the structure of the banking and financial system) and macroeconomic factors (which relate to the overall macroeconomic environment in which banks operate).

2.3.1 Internal determinants of bank profitability

The main internal determinants identified by scientific research are: the operational efficiency, the size of the bank, the level of capitalization of the bank, the level of income diversification, the credit risk, the liquidity and the level of deposits.

Operational efficiency : A bank that controls its operating expenses to contain them at an optimal level in relation to its net operating income increases its profits. This is because lower costs translate into higher profits. Conversely, a high cost-to-income ratio should weigh negatively on the annual results. Therefore, operational efficiency is expected to have a positive impact on bank profitability. Numerous studies have highlighted the positive relationship between operational efficiency and profitability. Indeed, Angbazo (1997) found a positive relationship between operational efficiency and NIM in the United States. Capraru & Ihnatov (2015) analyzed the determinants of banking profitability in 15 European Union countries over the period 2001-2011and found that operational inefficiency has a negative and significant impact on all of the profitability measures adopted in their study. We therefore believe that the ratio of general operating expenses to operating income has a negative effect on NIM and that, therefore, the relationship between operational efficiency and NIM (net interest margin) is positive.

H1: There is a positive relationship between operational efficiency and profitability.

Size : Large banks generally have the ability to raise funds at lower costs and therefore generate higher profits Short (1979). In addition, they benefit from economies of scale which allows them to generate more income. Smirlock (1985) has also found a positive relationship between size and profitability. We therefore hypothesize a positive relationship between size and profitability.

H2: There is a positive relationship between size and NIM

Capital ratio : The bank capitalization ratio measures the level of the bank's capital. The capital ratio (equity to total assets ratio) is an appreciated tool for assessing capital adequacy, and it captures the general soundness of a bank as it represents how well it is capitalized. It is considered as one of the basic measures of capital strength. Logically, the higher this ratio, the less the bank will need external financing and therefore the more profitable it will be. Moreover, according to the signalling theory, a better capitalized bank reflects to investors the image of a financially sound bank, which allows it to raise funds at lower costs and thus optimize its net interest margin. Many reasearchers found a positive relationship between capital and profitability : Bourke (1989); (Molyneux & Thornton (1992) ; Abreu & Mendes (2002). In Morocco, Bahyaoui (2017) has also proven the positive impact of capitalization on the Global Gross Margin. Consequently, we hypothesize a positive relationship between capitalization and profitability.

H3. There is a positive relationship between capital ratio and bank profitability.

Diversification : Intermediation is the traditional activity of a bank. It consists of collecting deposits from savers for the granting of loans to borrowers. Banks thus earn a margin of interest by granting loans at rates above the cost of resources. The more a bank derives its income from the net interest margin (and therefore from the classic intermediation activity), the less diversified it is. The higher the other incomes (income derived from commissions and market transactions), the more diversified is the bank. We believe that diversification generates additional income for the bank resulting in increased ROA and ROE. On the other hand, we estimate that when banks try to diversify their sources of income by trying to increase income from commissions or market activities, this is done at the expense of net interest margin. Therefore, the impact of diversification on NIM is expected to be negative.

H4: There is a negative relationship between income diversification and NIM

Credit-risk : In the studies on bank profitability's determinants, credit risk is generally measured through one of the following two ratios: the ratio of « provision for depreciation of receivables / total loans » or the ratio « bad debts / total loans ». In Greece, (Athanasoglou et *al.*, 2004) studied a panel of Greek banks over the period 1985 to 2001 and demonstrated that credit risk has a negative effect on profitability. As for Bahyaoui (2017), she found that in Morocco, the credit risk positively impacted the overall bank margin and explained this positive effect by the fact that Moroccan banks pass this risk on to their customers to compensate for the loss suffered. We believe that the increase in credit risk translates into an increase in bad credit and therefore in the level of provisions for impairment of receivables. This should have a negative impact on its net income and therefore its return on assets (ROA) and equity (ROE). On the other hand, we think that the impact of credit risk on NIM should be positive due to the fact that the increase in credit risk is generally the consequence of the increase in loans volumes which leads to an increase in interest income and NIM. Therefore, we expect a positive relationship between credit risk and NIM.

H5: There is a positive relationship between credit risk and NIM

Deposits : Banks rely significantly on customer deposits to allocate loans to other customers. Therefore, a bank with more deposits will be able to provide more loans and generate more profits. Moreover, it is estimated that a bank with a higher level of deposits will have less need to resort to costly funding from the markets which will ultimately result in an increase in its net margin interest and its profits. Menicucci & Paolucci (2016) have shown that the profitability of large European banks is positively impacted by the level of deposits. We therefore expect a positive relationship between the level of deposits and bank profitability.

H6: There is a positive relationship between the level of deposits and bank profitability.

Liquidity : In many studies on bank profitability, general liquidity risk is measured through the ratio "loans / deposits". The higher the loan to deposit ratio, the less liquid is the bank and the higher the liquidity risk. Alexiou & Sofoklis (2009) demonstrated that this ratio has a negative and statistically significant effect on profitability, which confirms the inverse relationship between liquidity and profitability proven by Molyneux &Thornton (1992). When the loan / deposit ratio increases, the bank is certainly less liquid, but it increases its rate of conversion of deposits into loans which should theoretically result in an increase in the intermediation margin (the NIM). We therefore expect a positive relationship between the liquidity risk and the NIM.

H7: There is a positive relationship between liquidity risk and NIM.

2.3.2 External determinants of bank profitability

Concentration : The concentration within the banking sector is usually measured through the HHI index (Herfindhal Hirshman Index) or through the ratio "the assets of the 3 or 5 most important banks over total assets of all banks). Numerous studies on banking profitability have

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highlighted the positive relationship between concentration and profitability: Short (1979), Molyneux & Thornton (1992), Demirguc-Kunt & Huizinga (1999), Athanasoglou *et al.* (2006). The Structure-Conduct-Performance (SCP) theory postulates that the structure of a market has an impact on the behaviour (conduct) of market players which, in turn, influences their performance: in a highly concentrated market, players who have a dominant position have more leeway to set the prices of their products and services and can generate profits due to their dominant position. Based on the results of the studies mentioned above (Short (1979), Molyneux & Thornton (1992)…) and referring to the SCP theory, concentration is expected to have a positive impact on profits.

H8: There is a positive relationship between concentration and profitability.

Economic growth : In Tunisia, Nouaili *et al.* (2015) found the relationship between GDP growth and net interest margin to be positive. In the MENA region, Elfeituri (2016) also found that profitability is positively correlated with GDP growth. In times of economic growth, general conditions are favorable, which leads economic agents (individuals and companies) to borrow more, thereby increasing banks' interest income. In addition, in times of economic growth, there are less unemployment and business failures which decreases the stock of debt impairment provisions. This positively impacts the profitability of banks. We therefore expect a positive relationship between GDP growth and profitability (NIM).

H9: There is a positive relationship between economic growth and bank profitability.

3. Data and Methodology

3.1. Methodology

The majority of studies on bank profitability: Short (1979), Bourke (1989), (Molyneux & Thornton (1992), and Goddard *et al.* (2004) used linear models to estimate the impact of some factors on bank profitability. Bourke (1989) suggests that any form of a function is qualitatively equivalent to the linear form. According to Short (1979), linear functions produce good results. Like previous studies, we will adopt a linear model relating banking profitability to a set of internal and external variables. Our linear model, similar to that adopted by Bourke (1989), is as follows:

$$y_{it} = c_i + \sum_{1}^{n} \alpha_i . x_{it} + \varepsilon_{it} \qquad \forall\, i \in [1;n]\,,\ \forall t \in [1;T]$$

$$c_i \in R,\ \alpha_i \in R$$

Where i refers to an individual bank; t refers to year; yit refers to the profitability of bank i in a particular year t; Xit represent the explanatory variables (both internal and external). εit is the error term and c is the intercept.

Like the majority of studies on the determinants of bank profitability, we will use the Ordinary Least Squares (OLS) method as well as the technique of panel data analysis in order to examine the relation between a dependent variable (in our case the profitability of the bank) and a set of explanatory variables. Many researchers have used the panel data method: Adelopo *et al.*(2018); Mishra *et al.* (2018) ; Bahyaoui (2017) ; Nessibi (2016); Menicucci & Paolucci(2016) ; Anarfi *et* al. (2016); Gary (2016).

3.2. Description of variables

3.2.1 Dependent variables

Like in previous studies on bank profitability, we choose ROA, ROE and NIM as profitability measures and dependent variables. In order to use the linear regression model, the

dependent variable must be normallly distributed. We therefore started by testing the normality of the dependent variables: ROA, ROE and MNI.

Table I : *Normality tests*

	ROA	ROE	NIM
Mean	0.884496	-100.9538	2.811614
Median	0.947692	10.51272	3.050677
Maximum	6.186352	56.98655	5.357003
Minimum	-7.795002	-12592.11	0.487434
Std. Dev.	1.041163	1190.957	0.956436
Skewness	-4.025775	-10.44019	-0.462057
Kurtosis	50.08607	110.0015	2.787035
Jarque-Bera	10648.99	55464.74	4.196928
Probability	0.000000	0.000000	0.122645
Sum	99.06354	-11306.83	314.9008
Sum Sq. Dev.	120.3263	1.57E+08	101.5394
Observations	112	112	112

Source : *Author*

The probabilities associated with the Jarque-Bera test are 0.00000, 0.00000, and 0.122645 respectively for the ROA, ROE and NIM, which means that only NIM follows a normal distribution. While neither the ROA nor the ROE follow the normal law. The normality tests therefore lead us to exclude the ROA and ROE as dependent variables because they do not meet the condition of normality which must be fulfilled in any linear regression model. Therefore, in our linear model, we will only use the NIM (Net Interest Income/Total Assets (%)) as dependent variable.

3.2.2 Independent variables

The effect of both internal and external factors will be examined to determine the extent to which they affect the Net Interest Margin (NIM). The table below details the explanatory variables taken into account in the models, their calculation methods and their expected effect on NIM:

Table 2 : *Explanatory variables*

CODE	FORMULA	DESCRIPTION	EXPECTED EFFECT
INDEPENDENT VARIABLES			
Bank-specific factors (internal factors)			
CAP	Total Equity/Total Assets (%)	Capital Adequacy	+
EFFOPE	general operating expenses / Net operationg Income	operational efficiency	-
LOGTAILLE	Logarithm of Total Assets	Size	+
NII	non-interest income/ total assets	Diversification	-
RISKCREDI1	Provisions for impairment of receivables / Total Assets	Credit risk	+
RISKCREDI2	Provisions for impairment of receivables / Total receivables	Credit risk	+
DEP	Total Deposits/Total Assets (%)	Deposits	+
LIQGEN	General liquidity ratio measured by the ratio: Total loans and receivables / total deposits	liquidity risk	+

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External factors			
PIB	Gross domestic product growth rate	Economic growth	+
C3ACTIF	total assets of the top 3 banks / total assets of all banks	Concentration in the banking sector	+
C5CRED	total loans of the top 5 banks / total loans of all banks	Concentration in the banking sector	+

Source : *Author*

In Eviews12, we run five (5) econometric models. In the first three models, we included only internal explanatory variables. In the last two models, we integrated external variables (measuring economic growth and the level of concentration of the banking sector).

The five models selected are as follows:

Model 1: NIM = C + C1 * CAP + C2 * EFFOPE + C3 * LOGTAILLE + C4 * LIQGEN + C5 * NII + C6 * RISKCREDI1 **(1)**
Model 2: NIM = C + C1 * CAP + C2 * EFFOPE + C3 * LOGTAILLE + C4 * LIQGEN + C5 * NII + C6 * RISKCREDI2 **(2)**
Model 3: NIM = C + C1 * CAP + C2 * EFFOPE + C3 * LOGTAILLE + C4 * DEP + C5 * NII + C6 * RISKCREDI2 **(3)**
Model 4: NIM = C + C1 * CAP + C2 * EFFOPE + C3 * LOGTAILLE + C4 * NII + C5 * RISKCREDI2 + C6*PIB + C7* C3ACTIF **(4)**
Model 5: NIM = C + C1 * CAP + C2 * EFFOPE + C3 * LOGTAILLE + C4 * NII + C5 * RISKCREDI2 + C6 * PIB + C7 * C5CRED **(5)**

3.3. Sample, data and period

Sample and period: The Moroccan banking sector is characterized by a high concentration of deposits and loans on three large banks (Attijariwafa Bank, Banque Centrale Populaire and BMCE Bank of Africa).

From 2009 to 2018, the Moroccan banking sector remained stable in terms of number of banks. In fact, during this period, 19 banks have been operating their activities (excluding islamic banks which started their activities in 2018). Out of these 19 banks, a sample made up of the eight largest banks in terms of total assets was selected. These 8 banks represent 86% of total banking assets in Morocco. These banks are: Attijariwafa Bank (AWB); Banque Centrale Populaire (BCP); BMCE Bank of Africa (BMCE Bank of Africa); CIH; Societe Generale Morocco; BMCI; Crédit du Maroc (CDM) and Crédit Agricole du Maroc (CAM). The period considered in this study is 2005-2018. This period includes the year of promulgation of banking law 24-03 (promulgated in 2006) and of the new banking law n ° 103.12 which was promulgated in 2014. It also includes a large part of the implementation period of Basel II and Basel III frameworks in Morocco.

Data : The gross values were taken from the banks' annual statements available on their respective websites and on the « Moroccan Capital Markets Authority » website. The ratios chosen as independent (explanatory) and dependent variables were calculated. The data relating to the concentration of the banking sector was extracted from the annual reports of the banking supervision of the Central Bank Of Morocco. As for the data relating to GDP growth in Morocco, it was extracted from the database available on the World Bank website. Since the data is collected for the same period without missing observations, the sample is balanced. In each of the models we have 112 observations for each of the variables retained.

4. Results and discussion

4.1. Descriptive statistics

The table below provides descriptive statistics for the selected variables (mean, median, standard deviation, etc.):

Table 3 : *Descriptive Statistics*

	NIM	CAP	EFFOPE	LOGTAILLE	LIQGEN	NII	RISKCREDI1	RISKCREDI2	PIB	CE3ACTIF	C5CRED
Mean	2.811614	**8.424563**	**53.68520**	**18.18945**	**93.63208**	**26.62623**	**4.467116**	**6.775028**	**4.038651**	**64.75714**	**79.53571**
Median	3.050677	**8.471991**	**51.86369**	**18.05485**	**92.59994**	**23.05427**	**3.637443**	**5.404766**	**3.951612**	**64.80000**	**80.65000**
Maximum	5.357003	**14.28621**	**114.1455**	**19.67521**	**137.6306**	**63.36903**	**27.96836**	**34.26735**	**7.574632**	**65.90000**	**81.80000**
Minimum	0.487434	**-6.037798**	**30.10421**	**16.77880**	**15.84908**	**5.823142**	**0.066225**	**0.325639**	**1.125977**	**63.40000**	**73.50000**
Std. Dev.	0.956436	**3.205010**	**12.97483**	**0.702073**	**21.55385**	**12.62484**	**4.067426**	**5.191685**	**1.507154**	**0.787025**	**2.398380**
Skewness	-0.462057	**-1.319133**	**2.101071**	**0.293494**	**-0.721249**	**1.057183**	**3.346098**	**2.908819**	**0.480122**	**-0.185920**	**-1.285194**
Kurtosis	2.787035	**6.326199**	**9.511033**	**2.261447**	**4.565604**	**3.645942**	**17.38841**	**14.03982**	**3.517589**	**1.754114**	**3.653378**
Jarque-Bera	4.196928	**84.11221**	**280.2406**	**4.153406**	**21.14893**	**22.80967**	**1175.122**	**726.7049**	**5.553178**	**7.888978**	**32.82439**
Probability	0.122645	**0.000000**	**0.000000**	**0.125343**	**0.000026**	**0.000011**	**0.000000**	**0.000000**	**0.062250**	**0.019361**	**0.000000**
Sum	314.9008	**943.5511**	**6012.743**	**2037.218**	**10486.79**	**2982.138**	**500.3170**	**758.8032**	**452.3290**	**7252.800**	**8908.000**
Sum Sq. Dev.	101.5394	**1140.202**	**18686.42**	**54.71261**	**51567.12**	**17691.92**	**1836.379**	**2991.849**	**252.1378**	**68.75429**	**638.4971**
Observations	112	112	112	112	112	112	112	112	112	112	112

Source : *Author*

The table below provides information on the degree of correlation between the explanatory variables used in the linear regressions. The matrix shows that in general the correlation between these variables is not strong suggesting that multicollinearity problems are not severe or non-existent. Kennedy (2008) points out that multicollinearity is a problem when the correlation is above 0.70, which is not the case here.

Table 4: *correlation table*

	NIM	CAP	EFFOPE	LOGTAILLE	LIQGEN	NII	RISKCREDI1	RISKCREDI2	PIB	CE3ACTIF	C5CRED
NIM	1.000000	**0.111376**	**-0.502723**	**-0.682383**	**0.722825**	**-0.796736**	**0.608192**	**0.572571**	**0.027415**	**-0.046761**	**-0.104635**
CAP	**0.111376**	1.000000	**-0.243585**	**0.169071**	**0.303654**	**0.175380**	**-0.255935**	**-0.262857**	**-0.184765**	**0.296103**	**0.411873**
EFFOPE	**-0.502723**	**-0.243585**	1.000000	**-0.119754**	**-0.500828**	**0.330047**	**-0.145038**	**-0.138537**	**0.078324**	**-0.095127**	**-0.193189**
LOGTAILLE	**-0.682383**	**0.169071**	**-0.119754**	1.000000	**-0.434019**	**0.599944**	**-0.560134**	**-0.530822**	**-0.173233**	**0.231428**	**0.388335**
LIQGEN	**0.722825**	**0.303654**	**-0.500828**	**-0.434019**	1.000000	**-0.568113**	**0.453861**	**0.355880**	**-0.088091**	**0.173086**	**0.328704**
NII	**-0.796736**	**0.175380**	**0.330047**	**0.599944**	**-0.568113**	1.000000	**-0.436406**	**-0.394507**	**-0.049753**	**0.024890**	**0.029506**
RISKCREDI1	**0.608192**	**-0.255935**	**-0.145038**	**-0.560134**	**0.453861**	**-0.436406**	1.000000	**0.981968**	**0.062813**	**-0.091661**	**-0.272918**

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RISKCREDI2	**0.572571**	**-0.262857**	**-0.138537**	**-0.530822**	**0.355880**	**-0.394507**	**0.981968**	1.000000	**0.079215**	**-0.117453**	**-0.342334**
PIB	**0.027415**	**-0.184765**	**0.078324**	**-0.173233**	**-0.088091**	**-0.049753**	**0.062813**	**0.079215**	1.000000	**-0.182961**	**-0.372080**
CE3ACTIF	**-0.046761**	**0.296103**	**-0.095127**	**0.231428**	**0.173086**	**0.024890**	**-0.091661**	**-0.117453**	**-0.182961**	1.000000	**0.596460**
C5CRED	**-0.104635**	**0.411873**	**-0.193189**	**0.388335**	**0.328704**	**0.029506**	**-0.272918**	**-0.342334**	**-0.372080**	**0.596460**	1.000000

Source : *Author*

4.2. Regression results

The empirical results obtained using Eviews 12 are summarized in the table below :

Table 5: *Empirical results*

Models	**Model (1)**			**Model (2)**			**Model (3)**			**Model (4)**			**Model (5)**		
Variables	**OLS**	**PDA (FE)**	**PDA (RE)**	**OLS**	**PDA (FE)**	**PDA (RE)**	**OLS**	**PDA (FE)**	**PDA (RE)**	**OLS**	**PDA (FE)**	**PDA (RE)**	**OLS**	**PDA (FE)**	**PDA (RE)**
CAP	**0,068800***	**0,078158***	**0,075452***	**0,064226***	**0,072238***	**0,069150***	**0,074038***	**0,068931***	**0,067081***	**0,067512***	**0,069244***	**0,068976***	**0,069442***	**0,064296***	**0,065146***
EFFOPE	**-0,025525***	**-0,011969***	**-0,013340***	**-0,024514***	**-0,010907***	**-0,012387***	**-0,025018***	**-0,015823***	**-0,016309***	**-0,024858***	**-0,016387***	**-0,017426***	**-0,024847***	**-0,016879***	**-0,017464***
LOGTAILLE	**-0,561358***	**-0,760777***	**-0,699204***	**-0,555733***	**-0,778773***	**-0,707466***	**-0,571385***	**-0,789136***	**-0,713366***	**-0,557895***	**-0,629023***	**-0,626215***	**-0,544790***	**-0,863059***	**-0,715334***
LIQGEN	**-0,001073**	**0,006694***	**0,004875**	**0,000915**	**0,009461***	**0,007397***									
NII	**-0,029580***	**-0,020148***	**-0,020916***	**-0,029301***	**-0,020338***	**-0,021086***	**-0,030579***	**-0,021742***	**-0,022413***	**-0,030054***	**-0,023571***	**-0,024724***	**-0,030761***	**-0,023241***	**-0,024001***
RISKCREDI1	**0,053317***	**0,059135***	**0,059395***												
RISKCREDI2				**0,038063***	**0,040549***	**0,040769***	**0,040003***	**0,042794***	**0,042506***	**0,038757***	**0,042279***	**0,042105***	**0,037527***	**0,043373***	**0,042672***
DEP							**0,005182**	**-0,017850***	**-0,013038***						
PIB										**-0,009672**	**-0,016443**	**-0,016195**	**-0,014318**	**-0,016216**	**-0,014239**
C3ACTIF										**-0,023403**	**0,000246**	**-0,001226**			
C5CRED													**-0,014747**	**0,035314**	**0,017502**
R-Squared	**0,912455**	**0,959814**	**0,763712**	**0,910871**	**0,956488**	**0,745715**	**0,911856**	**0,954906**	**0,737254**	**0,911186**	**0,952204**	**0,750494**	**0,911656**	**0,953458**	**0,752036**
Adjusted R-Squared	**0,907452**	**0,954483**	**0,750210**	**0,905777**	**0,950716**	**0,731185**	**0,906819**	**0,948924**	**0,722240**	**0,905208**	**0,945306**	**0,733701**	**0,905710**	**0,946741**	**0,735346**
F-Statistic	**182,3966**	**180,0510**	**56,56219**	**178,8436**	**165,7124**	**51,32051**	**181,0393**	**159,6335**	**49,10428**	**152,4267**	**138,0332**	**44,68919**	**153,3169**	**141,9383**	**45,05935**
Prob(F-Statistic)	**0,000000**	**0,000000**	**0,000000**	**0,000000**	**0,000000**	**0,000000**	**0,000000**	**0,000000**	**0,000000**	**0,000000**	**0,000000**	**0,000000**	**0,000000**	**0,000000**	**0,000000**

OLS : Ordinary Least Squares method **PDA FE** : Panel Data Analysis (Fixed Effects) **PDA RE** : Panel Data Analysis (Random Effects)
(*) the effect is statistically significant

Source : *Author*

The results obtained using Eviews12 show that in all the models taken into account, the coefficients associated with the variable CAP are positive and those associated with the variables EFFOPE, LOGSIZE and NII are negative. The effects of these four variables on NIM are statistically significant.

As for the coefficients associated with the variables measuring credit risk (RISKCREDI1 and RISKCREDI2), they are positive. The effect of these variables is statistically significant.

Regarding the coefficients associated with the GDP variable in models 4 and 5, they are negative, meaning that the impact of economic growth is negative on the profitability of Moroccan banks in terms of NIM. However, this impact is statistically insignificant. The same applies to the variables C3ACTIF and C5CRED whose effect on profitability is not significant.

4.3. Discussion

The specification tests conducted on Eviews12 (redundant fixed effects tests and Hausman test) showed that the random effects models are the best ones. Therefore, the results obtained with these models (random effects) will be taken into account. In all of the Random Effects models, the coefficients associated with the following variables: CAP, RISKCREDI1, RISKCREDI2 and LIQGEN are positive which means that these variables are positively correlated with the NIM. In addition, the effects of these variables are statistically significant. As for the coefficients associated with the following variables: LOGTAILLE, EFFOPE and NII, they are negative. We can therefore conclude that they are negatively correlated with the dependent variable, the NIM. In addition, their impact is statistically significant. On the other hand, the empirical results have shown that the effects of external variables (PIB, C3ACTIF, C5CRED) are not statistically significant. We can conclude that the profitability of Moroccan banks, measured by the NIM, is impacted only by internal factors. External factors (economic growth and the concentration of the banking market) seem to have no effect on bank profits.

The internal factors that impact the NIM of banks in Morocco, highlighted by the econometric study, are: size, capitalization, credit risk, operational efficiency, diversification, liquidity risk, level of deposits. Among these factors, size is the one that has the most important effect on profitability. This effect is negative which means that any increase in size results in a decrease in profitability. This negative effect is confirmed by Mansouri *& Afroukh* (*2*009) who highlighted a negative relationship between the size of the bank measured by the natural logarithm of total assets and the return on assets suggesting that in general, the theory of economies of scale does not apply in the case of Morocco. Kohlscheen *et al.* (2018) also found a negative effect between size and profitability in their study of 19 emerging countries during the period 2000-2014. The negative effect of size on NIM means that the theory of economies of scale therefore does not apply in the Moroccan case. One of the explanations of this result is the fact that large banks apply aggressive pricing to loans provided to customers which results in a erosion of their net interest margin.

The second internal factor that impacts banks' NIM is the level of capital held by the bank. The effect of this factor is positive. It means that a better capitalized bank will see its net interest margin increase. A better capitalized bank has less recourse to external financing to support its development and, if it needs funding, it obtains them on advantageous conditions and at lower costs because it is perceived as financially sound (signal theory). Bahyaoui (2017) had obtained similar results by proving that in Morocco, capitalization had a positive impact on the Global Gross Margin. In the European Union, Abreu & Mendes (2002) have also shown that the level of capitalization has a positive and statistically significant effect on profitability measured by the following indicators: NIM, ROA and ROE.

The third internal factor impacting the profitability of banks in Morocco is the level of credit risk. The effect of credit risk on NIM is positive and statistically significant across regression models and with all statistical / econometric methods used. This result is in line with that obtained by Bahyaoui (2017), who found that in Morocco, the credit risk (measured by the ratio of bad debts / trade receivables) positively impacted the overall banking margin and explained this positive effect by the fact that Moroccan banks pass this risk on to their customers to compensate for the loss suffered.

The other internal factor having a statistically significant effect on banking profitability in Morocco is operational efficiency. Note that this positive effect confirms the results obtained

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by Angbazo (1997) who found a positive relationship between operational efficiency and NIM in the United States and Capraru & Ihnatov (2015) who revealed that operational inefficiency has a negative and significant impact on all the profitability measures (ROAA, ROAE and MNI) adopted.

Income diversification is also one of the determinants of bank profitability in the Moroccan context but it has a negative effect on NIM. This leads us to conclude that the diversification of banks income in Morocco comes at the expense of their intermediation margin. As for the size of deposits and liquidity risk, although they are determinants of the profitability of banks in Morocco, their effect is limited.

The table below summarizes the results obtained and compared them with the expected results :

Table 6: Hypothesis check

Variable	Expected effect	Empirical Result	Hypothesis verification
Bank-specific factors (internal factors)			
EFFOPE	-	-	H1 confirmed
LOGTAILLE	+	-	H2 infirmed
CAP	+	+	H3 confirmed
NII	-	-	H4 confirmed
RISKCREDI1 RISKCREDI2	+	+	H5 confirmed
DEP	+	-	H6 infirmed
LIQGEN	+	+	H7 confirmed
External factors			
C3ASSETS C5CRED	+	not significant	H8 infirmed
GDP	+	not significant	H9 infirmed

Source: *Author*

5. Summary and conclusions

The objective of this study was to identify the determinants of the profitability of banks in Morocco measured through the NIM (net interest margin), in the context of implementation of Basel regulations. Using the ordinary least squares method and panel data analysis on a representative sample of 8 banks in Morocco during the period (2005-2018), it has been shown that profitability is determined only by internal factors. These factors are : size, capitalization, credit risk, operational efficiency, diversification, liquidity risk, level of deposits.

The effect of size is negative which means that any increase in size results in a decrease in profitability. Income diversification has also a negative effect on NIM. As for capitalization, operational efficiency and credit risk, their effect is positive which means that better capitalized banks that manage well their costs are more profitable. The positive effect of credit risk on profitability can be explained by the fact that Moroccan banks pass this risk on to their customers to compensate for the loss. Regardinbg the size of deposits and liquidity risk, although they are determinants of the profitability of banks in Morocco, their effect is limited.

The empirical findings of this study have numerous implications for bank managers as well as for the Central Bank of Morocco. For Moroccan bank managers wishing to maximize their banks' profitability, they should increase the level of bank capitalization, reduce the level of general operating expenses, take more credit risk and not bet on income diversification nor on the the growth of the assets'size which are not favorable to improving the Net Interest Margin. For the Moroccan Bank regulator (Central Bank of Morocco), it should maintain its policy

aiming at increasing the level of banks'capitalization and encouraging banks to reduce their operational costs.

This study didn't investigate the impact of some factors such as taxation, inflation, interest rate … on banking profitability. Future research could aim to throw more light on the effect of those factors.

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